

REMARKS/ARGUMENTS

Favorable reconsideration of the present application is respectfully requested.

The feature of Claim 4 whereby the pulse of electrical energy is at least 8 kJ has been incorporated into Claims 1 and 12. These claims now also explicitly recite that the metallic member is plastically deformed while being maintained at or near room temperature. Basis for this is found, e.g., at the paragraph bridging pages 14-15, and at page 17. New Claims 13 and 14 are based on Claim 8. Basis for the new claims, as well as new dependent Claim 15, is found at page 19, line 18 to page 20, line 22.

The previously applied prior art rejection has been withdrawn in favor of new grounds of rejection. Specifically, Claims 1, 2 and 7-12 were rejected as being anticipated by U.S. patent 5,813,264 (Steingroever). Claims 1-12 were rejected as being obvious over the newly applied U.S. patent 2,976,907 (Harvey et al.). These rejections are respectfully traversed.

Since Claims 1 and 12 now incorporate the subject matter of Claim 4, the rejection of Claims 1, 2 and 7-12 as being anticipated by Steingroever is believed to be moot (except as noted below for new Claims 13-15). On the other hand, Claim 4 was included on the rejection based upon Harvey et al. Nonetheless, the claims are also believed to define over Harvey et al..

As previously described, according to the claimed invention the end of a metallic member in a mold is expanded to form a flange having a predetermined shape by inputting an instantaneous or single pulse of electromagnetic energy at the end of the metallic member. Additionally, the instantaneous or single pulse of electromagnetic energy is sufficient for plastic deformation of the metallic member to expand and press the outer surface of the end of the metallic member onto a forming surface of the mold, thereby forming the flange *at or near room temperature* and work-hardening the flange (see the paragraph bridging pages 14-

15, and page 17). It is noted that such work hardening is not inherent in all metalworking, but only that done at or near room temperature.

For example, according to the non-limiting embodiment illustrated in Figure 1, the metallic member may be an aluminum alloy tube positioned within a mold 3 having a forming surface 4. A current carrying coil 5 inserted within the tube 1 is energized by a high current generator which causes a single impulsive force to be applied to the metallic member 1. According to a feature of the invention, the impulse applied through the coil 5 should be sufficient to plastically deform the metallic member 1 so as to expand and press an outer surface of the end of the metallic member 1 onto the forming surface 4 of the mold. Because this is done substantially instantaneously, the flange is deformed *at near room temperature* and is not softened. This causes work-hardening of the flange, which compensates for the thinning of the flange and helps assure sufficient strength in the subsequently formed joint.

There is no teaching in Harvey et al of plastically deforming a metallic workpiece at or near room temperature, and without work hardening, by the input of electrical energy. Rather, Harvey et al is like the prior art noted in the present specification insofar as it teaches that a number of pulses may be supplied in order to achieve the desired deformation. However, Harvey et al fails to recognize or teach that in such a case the energy is distributed over a time period which enables the workpiece to heat up and become softened so that the deformation is not accompanied by work hardening.

Claims 1-12 now recite that the amount of electrical energy which is input is 8 kJ or more. This is sufficient to expand the flange instantaneously so that it deforms at or near room temperature. In contrast, the embodiment of Figure 9 of Harvey et al uses a 60  $\mu$ F capacitor supplied with 10 kV (col. 5, lines 13-15), which provides an energy input of only 3 kJ, i.e., less than 40 percent of the claimed energy level. Since Harvey et al does not teach the importance of deformation with work hardening at or near room temperature there is no

reason to believe that the disclosed energy input in Harvey et al will provide deformation of the workpiece in a time sufficiently short to avoid heating of the workpiece and to achieve work hardening at or near room temperature. For the same reason, Harvey et al would not have motivated those skilled in the art to have increased the energy level therein to at least 8 kJ. The amended claims therefore define over this reference.

New Claim 13 recites the feature of Claim 8 whereby the flange has a shape conforming with the shape of the outer surface of another metallic member to be joined to the metallic member. As is described on page 20 of the specification, this has the advantage that it is not necessary to subsequently reshape the flange to conform to the other metallic member. Thus the flange can be formed to its final shape and work hardened at the same time. For example, the flange can be given a saddle shape to conform to a tubular member (Fig. 10A-10C). New Claim 14 additionally recites the step of joining the flange to the second metallic member.

The Examiner has recognized that no such flange is formed in Harvey et al but alleges that it would have been obvious in view of the corrugations in Figure 10 of Harvey et al to have formed a flange “wherever desired on the workpiece.” The Examiner is respectfully reminded that 35 U.S.C. § 103 requires that a motivation be put forth for modifying the prior art. The Examiner’s allegation does not put forth a motivation for one skilled in the art to have formed a flange having a predetermined shape at the end of the metallic member, other than that a flange at any location would be equally obvious. However, this allegation does not account for the advantage of the invention whereby the flange can be shaped to its final shape conforming to another metallic member, and work hardened at the same time.

Applicant respectfully submits that the formation of corrugations at a mid-portion of the tube in Figure 10 of Harvey et al would not have provided a suggestion for modifying a method for electromagnetically forming a metallic member, or for joining metallic members, to have

incorporated the presently claimed step of forming a flange having a shape conforming with the shape of the outer surface of another metallic member to be joined to the metallic member, at the same time, to work-harden the flange, in view of the advantages achieved thereby.

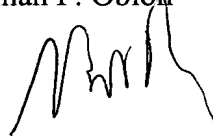
Figure 6 of Steingroever discloses electromagnetically expanding the end of a pipe, but not to form a flange to be connected to another member. Claims 13-15 therefore are not anticipated by Steingroever. Additionally, those skilled in the art would not have been motivated to have modified Steingroever to form a flange having a shape conforming with the shape of the outer surface of another metallic member to be joined to the metallic member, at the same time, to work-harden the flange. The above remarks therefore also apply to the rejection based on Steingroever.

Concerning the rejection under 35 U.S.C. § 112, it is noted that the recitation of an element provides antecedent basis for inherent components of the element. MPEP § 2173.05(e). Therefore, since the "deformed end" of Claims 1 and 8 inherently has an outer surface and the "flange" of Claim 6 inherently has a back, the recitations of these claims are believed to be definite under 35 U.S.C. § 112. Additionally, as to the objection that Claim 8 attempts to define the flange in terms of a structure which is not positively recited, Applicants respectfully note that this is permitted so long as the metes and bounds of the claims is not rendered indefinite thereby. MPEP § 2173.05(b). For example, in *Orthokinetics, Inc. v. Safety Travel Chairs, Inc.*, 1 USPQ2d 1081 (Fed. Cir. 1986), the court held that a claim limitation specifying that a certain part of a pediatric wheel chair was "so dimensioned as to be insertable through the space between the door frame of an automobile and one of the seats" was considered definite under 35 U.S.C. § 112, even though the vehicle itself was not part of the claimed combination, because this recitation was "as accurate as the subject matter permits."

Applicant therefore believes that the present application is in a condition for allowance and respectfully solicits an early notice of allowability.

Respectfully submitted,

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